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Proceedings of the Fourth International Conference and Exhibition: World Congress on Superconductivity

*Proceedings of a conference and exhibit held at Marriott Orlando World Center, Orlando,
Florida, June 27 – July 1, 1994*

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*Kumar Krishen and Calvin Burnham, Editors
Lyndon B. Johnson Space Center
Houston, Texas*

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Florida, June 27 – July 1, 1994*

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Houston, Texas 77058-3696

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INTRODUCTION

The World Congress on Superconductivity (WCS) is a nonprofit organization dedicated to the universal promotion of research, development, and applications of superconductivity technology. Through open meetings and conferences, it provides forums for the world community to share technological and research results in the field of superconductivity and to discuss the translation of these results into applications which will benefit all of the world's population. The WCS established the Award of Excellence to recognize the contributions of organizations and individuals within the industry. Since 1988, nineteen individuals and organizations have received this recognition.

The WCS presented its first two International Conferences and Exhibition World Congresses on Superconductivity in 1988 and 1990, with a combined attendance of approximately 1,000 delegates from 16 countries. Its third conference, attended by more than 400 scientists, technologists, and managers from thirty six nations, was held in Munich, Germany in September 1992. Proceedings from these three conferences have been published and distributed worldwide.

The Fourth International Conference and Exhibition World Congress on Superconductivity was held June 27-July 1, 1994 in Orlando, Florida. It was sponsored in large part by the National Aeronautics and Space Administration's Johnson Space Center. More than 120 presentations were scheduled for the more than 200 delegates from 30 nations who attended this year's conference. I believe this conference provided the most comprehensive worldwide review of high temperature superconductivity research and its applications to date (table 1). The exchange of information and ideas and the identification of technical and commercial challenges which occurred during the conference are bound to significantly advance this revolutionary technology.

The substantial progress which has been made in the field of superconductivity was reflected in the conference presentations: the number of elements used in the search of superconductivity has increased to eight; the reported critical temperatures have increased to 164°K; and a new thallium-based compound, reported by Professor Z.Z. Sheng, is expected to provide further insight into the mechanisms that govern the complex phenomena of superconductivity. Additionally, significant progress was reported with theoretical and modeling efforts which will accelerate research and development of new materials and devices, and with magnetic field capacity and electrical current capacity. The parameters for these capacities are now quoted at 77°K at 2.2 Tesla and 100,000 Amps/cm², respectively.

The commercial applications of superconductivity are progressing rapidly, with magnets, SQUIDS, transformers, thin films, wires, and several devices now available commercially. And the worldwide interest in the exploration of this revolutionary technology continues to grow.

To create the uniquely efficient superconductor many production components must be orchestrated. Teaming the exact mix and proportion of elements, arranging the different

layers of elements in the appropriate order, and achieving the right environment and temperatures in which to cook the elements are essential.

Any technology which enhances our quality of life truly is super and I believe superconductivity will do just that. This revolutionary technology will be an integral part of future achievements which will produce great benefits for humans.

The process involved in developing superconductors is an excellent example of the great results that can be achieved by successfully teaming different elements. It should symbolize for us the advances we are capable of when we work together. Most of the technological advances made in this field in recent years are the result of teamwork. One of the objectives of this conference was to promote global teaming which transcended geographic and national barriers and helped to advance science and technology related to superconductivity. Since we collectively share the challenge of advancing teamwork and cooperation, we hope that several dialogues were initiated during this conference.

Some of the many enthusiastic researchers, technologists, and program directors who helped develop this conference are listed in table 2. The speakers for the opening session, held on the morning of June 27, 1994, are listed below.

Mr. Calvin Burnham Welcome	President, WCS
Dr. Kumar Krishen Opening Remarks	Program Chair, WCS
Dr. Gye-Won Hong	Korea
Dr. R.S. Liu	Republic of China
Prof. Manu S. Multani	India
Dr. Naoki Koshizuka	ISTEC, Japan
Dr. Wei Kan Chu	TCSUH, U.S.
Dr. Valeri Ozhogin	Russia
Prof. Z.Z. Sheng	University of Arkansas, U.S.

Table 1. Schedule of Events - Fourth World Congress on Superconductivity

Sunday, June 26, 1994 - 1:30 PM - 7:00 PM		Registration: 7:00 PM - 9:00 PM Reception					
Monday, June 27, 1994 - 8:30 AM - NOON		INTERNATIONAL UPDATE					
1:30 - 5:30 PM	1:30 - 5:30 PM	1:30 - 5:30 PM					
Accelerator Technology	Power/Energy Applications	Persistent Magnetic Fields					
7 PM - 9 PM ROUNDTABLE DISCUSSION - "Technical and Commercial Challenges"							
Tuesday, June 28, 1994 - 8:30 AM - Noon							
Physical Properties 1	Performance Characterization 1	SMES 1					
LUNCHEON Noon - 1:30 PM							
1:30 - 5:30 PM	1:30 - 5:30 PM	1:30 - 5:30 PM	1:30 - 5:30 PM	1:30 - 5:30 PM			
Medical Applications	Physical Properties 2	Performance Characterization 2	Fabrication Methodology 1	SMES 2			
Wednesday, June 29, 1994 - 8:30 AM - Noon							
Granular Superconductors 1	Thin Films	SMES 3					
Afternoon free for tours or sightseeing							
Thursday, June 30, 1994 - 8:30 AM - Noon							
WCS-5 Planning	Device Applications Chair	High-Temperature Materials 1					
1:30 - 5:30 PM	1:30 - 5:30 PM	1:30 - 5:30 PM					
Wire Fabrication Technology	Device Applications Chair	High-Temperature Materials 2					
AWARDS BANQUET 7:00 PM - 9:00 PM							
Friday, July 1, 1994 - 8:30 AM - Noon							
Granular Superconductors 2	Poster Session 1	Poster Session 2					
Meeting ends at Noon							

Table 2. WCS List of Program Organizers

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Dr. Kumar Krishen
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PERSISTENT MAGNETIC FIELDS AND SHIELDING

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THIN FILMS

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WEAK LINK EFFECTS & FLUX MOTION

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C-60 BASED SUPERCONDUCTORS

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Table 2. WCS List of Program Organizers (Concluded)

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I would like to thank Mr. Calvin Burnham, Mr. Glenn Carraux, Dr. Jim Salinas, Dr. Tsuneo Nakahara, and Dr. Z.Z. Sheng for their exhaustive efforts in organizing and implementing this international event. The roundtable discussion on technical and commercial challenges was organized by Dr. Tsuneo Nakahara and chaired by Dr. Ken-ichi Sato. The brief presentations and responses given by the panelists stimulated a wide-ranging question and answer session. The panelists for the roundtable discussion included Dr. Ken-ichi Sato from Osaka Research Laboratory, Dr. M. Takano from Kyoto University, Dr. D. Lu from Midwest Superconductor, Inc., Dr. Wei-Kan Chu from TCSUH, and Dr. Istvan Vajda from the Technical University, Hungary. Dr. Usha Varshney chaired the session on Thin Films and Ms. Yelena T. Oltarzhevskay chaired the session on Device Applications. I would like to thank them both as well as all of the roundtable panelists for their contributions. Finally I would like to thank Dr. C.W. (Paul) Chu for the illuminating keynote address he presented at the conference, Dr. Istvan Kirchner for his review of the work being done in Hungary, and Professor Vladislav V. Lemanov of the Russian Academy of Sciences for the keynote address he presented at the Awards Banquet. I am sure that the depth and breadth of Prof. Lemanov's knowledge provided a wholly unique perspective for the 250 in attendance at the banquet.

Throughout my thirty-year career, first with Kansas State University, then with Lockheed Electronics Company and now with the National Aeronautics and Space Administration (NASA), I have supported the space program. The paramount missions of NASA have always ignited my imagination and my determination. Today one of the key missions for NASA is researching the universe: its origin and growth, its formation of bodies and systems, and its governing processes. Another mission of this Agency is to explore the evolution of life within the universe. Through the efforts of many nations, we have come to realize the critical link between human life and the global environment, and, as an extension of this, between the phenomena that underlie the nature of our universe. NASA's current mission addresses the need to expand our knowledge about our universe, as does research in the area of superconductivity. This research will provide a means to characterize unique phenomena which might otherwise be unobservable. We hope that these proceedings will help identify ways to advance the performance and applications of high temperature superconductors.

Kumar Krishen, Ph.D.
Program Chairman
World Congress on Superconductivity

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13. ABSTRACT (Maximum 200 words) The WCS is a nonprofit organization dedicated to the universal promotion of research, development, and technology applications. It provides forums for the world community to share technological and research results in superconductivity and to discuss the translation of these results into applications to benefit the world. The WCS presented its first two International Conferences and Exhibition World Congresses on Superconductivity in 1988 and 1990, with a combined attendance of approximately 1,000 delegates from 16 countries. Its third conference, attended by more than 400 scientists, technologists, and managers from thirty six nations, was held in Munich, Germany in September 1992. The Fourth conference was held June 27-July 1, 1994 in Orlando, Florida, sponsored in large part by NASA's Johnson Space Center. The exchange of information and ideas and the identification of technical and commercial challenges which occurred during the conference are bound to significantly advance this revolutionary technology. The substantial progress made in the field was reflected in the conference presentations. Significant progress was reported with theoretical and modeling efforts which will accelerate research and development of new materials and devices, and with magnetic field capacity and electrical current capacity. The commercial applications of superconductivity are progressing rapidly, with magnets, SQUIDS, transformers, thin films, wires, and several devices now available commercially. And the worldwide interest in the exploration of this revolutionary technology continues to grow. This revolutionary technology will be an integral part of future achievements which will produce great benefits for humans.			
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